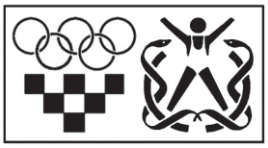

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PRELIMINARY PSYCHOMETRIC VALIDATION OF THE MULTIDIMENSIONAL INVENTORY OF SPORT EXCELLENCE: ANXIETY AND HARDINESS SCALES

PRELIMINARNA PSIHOMETRIJSKA VALIDACIJA MULTIDIMENZIONALNOG UPITNIKA SPORTSKE IZVRSNOSTI: SKALE ANKSIOZNOSTI I MENTALNE ČVRSTOĆE

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SUMMARY

Sports psychologist needs to understand how psychological factors affect the performance of an individual, and must take account of individual differences among athletes. Although there are numerous psychological measurement instruments for assessing the important psychological characteristics of the athletes, it is important to select instruments to customize athletes with whom we work, adjusting with the work style of sports psychologists, as well as to available time and other constraints. The aim of this study is to determine the basic psychometric characteristics of three questionnaires, made out in the preliminary version of its own battery of questionnaires, called Multidimensional questionnaire sporting excellence (MUSI). Items cover space of following psychological characteristics: somatic and cognitive anxiety and mental hardiness / toughness. In this part of the study, participants were stratified only by gender. Our sample included 248 participants, of which 103 athletes (age 24.52 ± 11.80 years) and 145 female athletes (age 16.61 ± 6.69 years), in the Croatian sports clubs, competing in 16 different sports (archery, football, handball, bocce, bowling, cycling, karate, rowing, tennis, volleyball, basketball, synchronized swimming, triathlon, table tennis, chess, badminton). Results of factor analysis and examination of reliability of internal consistency showed that each of subscales in the battery MUSI has satisfactory reliability and validity, giving positive guidance for future adaptation of the questionnaires in MUSI for specific subpopulations of the athletes.

Keywords: diagnosis, practical skills, sports excellence

SAŽETAK

Sportski psiholog treba razumjeti kako psihološki čimbenici utječu na izvedbu pojedinca, a pritom treba voditi računa o individualnim razlikama sportaša. Premda postoje brojni psihologijski mjerni instrumenti namijenjeni procjeni bitnih psiholoških obilježja sportaša, važno je odabir instrumentarija prilagoditi populaciji sportaša s kojima radimo te stilu rada sportskog psihologa, kao i raspoloživom vremenu i drugim ograničenjima. Cilj ovog istraživanja je određivanje temeljnih psihometrijskih karakteristika triju upitnika, sastavljenih u preliminarnoj verziji vlastite baterije upitnika, nazvane Multidimenzionalni upitnik sportske izvrsnosti (MUSI). Čestice koje pokrivaju prostor sljedećih psiholoških obilježja: somatska i kognitivna anksioznost te mentalna čvrstoća/žilavost. U ovom dijelu istraživanja, sudionike smo stratificirali samo po spolu, ispitavši 248 sudionika, od toga 103 sportaša (dobi 24,52±11,80 godina) i 145 sportašica (dobi 16,61±6,69 godina), iz hrvatskih sportskih klubova, koji se natječu u 16 različitih sportova (streličarstvo, nogomet, rukomet, boćanje, kuglanje, biciklizam, karate, veslanje, tenis, odbojku, košarku, sinkronizirano plivanje, triatlon, stolni tenis, šah, badminton). Rezultati faktorske analize te provjere pouzdanosti tipa interne konzistencije su pokazali da svaki od subupitnika baterije MUSI posjeduje zadovoljavajuću pouzdanost i valjanost, što daje pozitivne smjernice za daljnje prilagođavanje upitnika u MUSI specifičnim subpopulacijama sportaša.

Ključne riječi: dijagnostika, praktične vještine, sportska izvrsnost

Introduction

In order to achieve sport excellence, athletes should develop attention skills and have enough mental toughness/ hardiness to cope with challenges, as well as to control their anxiety. Since there is no valid, objective measure of any mood, self-reported feelings are recognized as the best method for assessing mood (14). In this article, we are mainly interested in cognitive and somatic anxiety, which are reflections of an individual's mostly negative feelings that arise before doing some activity (in this case, it is sport performance). On the other hand, mental toughness/ hardiness describes dispositions of an individual to cope with stress in different situations (13).

1.1. Cognitive and somatic anxiety

Pre-competition anxiety has been an important focus of research in sport and performance psychology (8, 20). There are some relevant theories describing relationship among anxiety and performance. Yerkes–Dodson law describes an empirical relationship between arousal and performance, originally developed by psychologists Robert M. Yerkes and John Dillingham Dodson in 1908 (8). The law dictates that performance increases with physiological or mental arousal, but only up to a point. When levels of arousal become too high, performance decreases. The process is often illustrated graphically as a curvilinear, inverted U-shaped curve which increases and then decreases with higher levels of arousal. There is another theory explaining relationship between anxiety and performance. Hanin is one of the original sport psychologists that researched a positive link between anxiety and sport performance. Hanin's theory is called the IZOF (Individual Zone of Optimum Functioning). Hanin came up with three examples of the athletes that are affected with indifferent bandwidths of anxiety. According to Hanin, every athlete has its own Zone in which he/she gives best performances. This is, of course, common sense description, but gives us valuable information concerning individual approach that has to be implemented while working with athletes.

Anxiety literature has separated anxiety into cognitive and somatic components (10, 1, 4). Cognitive anxiety refers to negative expectations and cognitive concern about performance, the consequences of failure, negative self-evaluation, evaluation of one's ability relative to others, the inability to concentrate, and disrupted attention. Somatic anxiety refers to one's perception of the affective physiological elements of anxiety, generated from an increase of autonomic arousal and unpleasant feelings such as nervousness, tension and upset. Serbetar, Massari and Massari (2005) conducted a research on 36 primary school students (18 male and 18 female) in Croatia and found no statistical differences among male and female students (17,18). Since there is small sample of students, no further conclusions wasn't made from this research. Craft, Magyar, Becker and Feltz (2003) predicted a negative linear relationship between cognitive anxiety and performance (3). However, the data did not provide support for this hypothesis. The overall correlation between cognitive anxiety and performance was .01 and did not differ significantly from zero. Furthermore, cognitive anxiety consistently displayed a positive rather than a negative relationship with performance. Craft et al. (2003) interpreted these findings in several ways (3). First, perhaps the multidimensional theory is incorrect and cognitive anxiety does not have a negative relationship with performance. Second, content validity could be the problem considering how items are phrased and therefore CSAI-2 inventory is not doing an adequate job of assessing cognitive anxiety. Another problem could be administration of this inventory. The way that it has been utilized in the primary research has been inappropriate and the relationship has thus been masked (e.g., administered too long prior to competition, administered to small samples, used to gather information on group rather than individual means, focus on overall score rather than specific items) (3).

1.2. Mental toughness/hardiness

Many people use this term liberally to refer to any set of positive attributes that helps a person to cope with difficult situations. Coaches and sport commentators freely use the term mental toughness to describe the mental state of athletes who persevere through difficult sport circumstances to succeed.

According to Jones, Hanton, and Connaughton (2002), mental toughness is having the natural or developed psychological edge that enables you to: generally, cope better than your opponents with the many demands (competition, training, lifestyle) that sport places on a performer; specifically, be more consistent and better than your opponents in remaining determined, focused, confident, and in control under pressure (7). Cherry (2003) developed a measure of mental toughness and found statistical support for a three-factor mental toughness model: Competitive desire, self-confidence, and resiliency (2). Jones et al. (2002) added focus in addition to the three components Cherry (2003) found to be central to mental toughness (7).

Competitive desire includes such characteristics as positive energy and enjoyment, which have been identified as central to performing well (11). In addition, self-confidence or sport confidence is defined as an overall positive belief in one's own ability to control outcomes and be successful (12). Resiliency is the ability of an athlete to endure negative outcomes, learn from mistakes and failure, remain positive, and go on to experience success (11). Focus is the ability to concentrate on the performance of a task even in the face of distraction. Focused athlete doesn't notice the other things going on around her/him, whether they be positive or negative which has been associated with sport excellence.

Hardiness is defined as a constellation of attitudes, beliefs, and behavioral tendencies and it consists of three positively intercorrelated components: commitment, control and challenge. Commitment is the ability to perceive what you are doing: a belief that an individual is capable of reaching a goal, even when the level of stress is beyond safe. Control is the ability to feel influential and on the basis of that belief to act in various (particularly in

stressful) life situations. Challenge is the belief that change is normal in life, more than stability, and that foreseeing changes represents an interesting stimulus in development (9). Hanton, Evans and Neil (2003) claim that top athletes who have top results in hardiness, especially in dimensions commitment and control, showed desirable characteristics of athletes (6). In other words, they are less concerning about the result and proactively interpreting the competitive anxiety. Sindik and Adzija (2013) conducted a research which aimed to establish the correlation between the standard and derived situation-related efficacy of male top basketball players in Croatia and hardiness latent dimensions (15). General findings suggest that much more statistically significant correlations are found for the hardiness dimension Control/Commitment than for the dimension Challenge. Authors assume that these results can lead to the possibility that multiple selected and several years trained basketball players may be very similar in many personal characteristics (including hardiness) important for the success in sport.

The purpose of these instruments is to help sport psychologists to predict and understand exactly how an individual will perform under a variety of circumstances. These information are of course very useful for their practical work with the athletes. Therefore, the goal of this research was to determine construct validity (factor structure) and reliability type internal consistence for each of the questionnaires included in this part of the Multidimensional Questionnaire of Sport Excellence (MUSI). Moreover, the second goal was to determine the correlations among the dimensions in all measuring instruments (questionnaires) in this research, as well as with the other scales of MUSI.

Participants and Methods

Participants

In total 248 athletes, 103 males (mean age 24.52±11.80) and 145 females (mean age 16.61±6.69) were involved in the study. They were recruited from different sport clubs in Croatia. Mean age of sport experience (participation in sport) of the participants was 8.62±6.97 years. The athletes from 16 different sports were included in research: archery (N=1), football (N=17), handball (N=47), bocce (N=2), bowling (N=2), cycling (N=7), karate (N=1), rowing (N=27), tennis (N=3), volleyball (N=57), basketball (N=32), synchronized swimming (N=19), triathlon (N=3), table tennis (N=2), chess (N=1), badminton (N=2). According to sport age category, 99 (39.9%) of them were cadets, 60 (24.2% were juniors), 77 (31.0%) were seniors, while 12 (4.8%) were veterans. According to the level of sport excellence, 37 (14.9%) of them were top Croatian athletes (e.g. national selection), 80 (32.3%) were semi-professionals (they work regularly out of sport, but they are engaged in regular training and national competitions), while 131 (52.8%) are amateurs, engaged in lower levels of competitive sport, or only in recreational sports.

Methods

Data were collected between March 2014 and July 2014 in the city of Rijeka, Croatia. Participants always filled out the questionnaire anonymously in the presence of a research assistant, or during or during the training, in belonging sports club.

Initial versions of all questionnaires have started from theoretical frameworks of studied constructs and belonging measuring instruments.

The intensity of anxiety is measured using modified version of the Competitive State Anxiety Inventory-2 (CSAI-2; Martens et al., 1990). CSAI-2 is used to estimate the participants' cognitive and somatic anxiety as well as self—confidence (13). Cronbach's alpha coefficients of internal consistency, for reliability averaged over the 11 measures, were .90 for cognitive, and .92 for somatic anxiety and self-confidence, which was similar to those noted by Martens and his colleagues (1990). The CSAI-2 consists of 27 items, 9 for each subscale (cognitive anxiety, somatic anxiety and self-confidence). Each item was rated on a 4-point Likert-type scale, producing a score ranging from a low 9 to a high 36 for each subscale. Our scales have separate items (and scales) for cognitive and somatic anxiety, each with 13 items. Also, all items are rated on a 5-point Likert-type scale.

Mental toughness/ hardiness is measured using the frameworks of two measuring instruments: Short Hardiness Scale (SHS) and 48-item Mental Toughness Questionnaire (MTQ48; Clough et al., 2002). The MTQ48 assesses total MT and six subcomponents: challenge, commitment, interpersonal confidence, confidence in own abilities, emotional control, and life control. The items on the MTQ48 were rated on a 5-point Likert-type scale anchored at 1 = Strongly disagree and 5 = Strongly agree. The MTQ48 in this study had an overall Cronbach's Alpha value of 0.87 with all individual scales scoring between 0.58 and 0.71. Short hardiness Scale (SHS) is consisted of 15 self-evaluation items, with a purpose of measuring the level of »hardiness». The subjects have to estimate their own behavior on Likert 4-point scale ranging from strongly disagree (0) to strongly agree (3). Five items of the scale refer to the commitment dimension, 5 to control and 5 to challenge.

Statistical Analyses

In the statistical analyses of the data, the software package SPSS 20.0 was used. In the process of determining the main metric properties of the questionnaires, for determining the construct validity of the questionnaires, the method of Principal Component Analysis (PCA) is used, with or without Varimax rotation (method Maximum Likelihood with Promax rotation is used only in Mental toughness scale). Several criteria are combined to obtain final component (factor) solutions: saturation higher than 0.300; Scree Plot; Guttman-Kaiser criterion (eigenvalue higher than 1.00) and interpretability criterion. The results in extracted principal components (factors) in certain questionnaires are expressed as simple linear combinations, and then used in further analysis (correlations). The reliability type

internal consistency for all components (factors) revealed was determined using Cronbach's alpha coefficient. The correlation analyses were performed using Spearman rank-correlation coefficients. The significance of differences commented on the probability level $p<0.05$.

Results

Descriptive characteristics and results of factor analyses with belonging reliabilities in all questionnaires are presented, separately on the samples of male and female athletes.

Table 1: Cognitive Anxiety Scale: descriptive characteristics and results of Principal Components Analysis (PCA) with belonging reliability, applied on the sample of male and female athletes

Table 1: Cognitive Anxiety Scale: descriptive characteristics and results of Principal Components Analysis (PCA) with belonging reliability, applied on the sample of male and female athletes

Tablica 1. Skala kognitivne anksioznosti: deskriptivna obilježja i rezultati analize glavnih komponenti (PCA) s pripadnom pouzdanošću, na uzroku sportaša i sportašica

Čestice – sportaši / Items - males	r	h^2	Mean	Std. Dev.
Nedostaje mi samopouzdanja. / I miss self-confidence.	0.691	.477	3.000	**1.468**
Osjećam zabrinutost da neću biti dovoljno dobar/a na natjecanju. / I am worried that I won't be good enough at competition.	0.769	.591	3.248	1.358
Brine me mogući neuspjeh. / I am worried for possible failure.	0.803	.644	3.362	1.327
Bojim se negativnog ishoda. / I am worried about negative outcome.	0.736	.541	**3.854**	1.128
Opterećen sam reakcijama okoline nakon svog nastupa. / I am burden with reactions of environment after my performance.	0.612	.374	3.428	1.332
Zabrinut sam da se ne razočaram nastupom. / I am concerned that I will be disappointed with performance.	0.789	.622	2.943	1.361
Bojim se velike treme. / I am afraid of big stage fright.	0.771	.594	3.200	1.321
Bojim se da se neću moći koncentrirati. / I'm afraid that I will not be able to concentrate.	0.535	.286	**4.065**	1.062
Bojim se da zbog velike treme neću moći ništa napraviti. / I'm afraid that I will not be able to do anything because of big stage fright.	0.793	.629	2.779	1.460
Bojim se da se zbog velike treme neću moći koncentrirati. / I'm afraid that I will not be able to do concentrate because of big stage fright.	0.702	.493	2.493	1.374
Bojim se da pod pritiskom neću moći funkcionirati. / I'm afraid that I will not be able to operate under pressure.	0.734	.538	2.577	1.475
Ne vjerujem u vlastiti uspjeh. (R) / I do not believe in my success.	0.397	.157	2.632	**1.532**
Ne vjerujem da se mogu nositi s pritiskom. (R) / I do not believe that I can cope with pressure.	0.494	.244	2.695	1.459
Ne vjerujem u dobar ishod. (R) / I do not believe in god outcome.	0.39	.152	3.722	1.179
Prosječne vrijednosti za cijelu ljestvicu / Average values for entire scale			**3.140**	**1.345**
Kaiser-Meyer-Olkin Measure / Bartlett's Test of Sphericity	.884		703.667** (df=91)	
Eigenvalue / Variance Explained (%)	6.344		45.316	
Reliability / Pouzdanost (Cronbach's alpha)	0.840			
Čestice – sportašice / Items - females	r	h^2	Mean	Std. Dev.
Nedostaje mi samopouzdanja. / I am missing selfconfidence.	0.643	.413	2.505	1.397
Osjećam zabrinutost da neću biti dovoljno dobar/a na natjecanju. / I am worried that I will not be god enough in competition.	0.827	.684	2.863	1.350
Brine me mogući neuspjeh. / I am worried for possible failure.	0.794	.630	2.775	1.364
Bojim se negativnog ishoda. / I am worried about negative outcome.	0.647	.419	**4.130**	0.849
Opterećen sam reakcijama okoline nakon svog nastupa. / I am burden with reactions of environment after my performance.	0.671	.450	2.922	**1.426**
Zabrinut sam da se ne razočaram nastupom. / I am concerned that I will be disappointed with performance.	0.727	.529	2.584	1.321
Bojim se velike treme. / I am afraid of big stage fright.	0.799	.638	2.922	**1.419**
Bojim se da se neću moći koncentrirati. / I'm afraid that I will not be able to do concentrate.	0.656	.430	**4.314**	0.856
Bojim se da zbog velike treme neću moći ništa napraviti. / I'm afraid that I will not be able to do anything because of big stage fright.	0.831	.690	2.356	1.277

Bojim se da se zbog velike treme neću moći koncentrirati. / I'm afraid that I will not be able to do concentrate because of big stage fright.	0.823	.678	2.324	1.336
Bojim se da pod pritiskom neću moći funkcionirati. / I'm afraid that I will not be able to operate under pressure.	0.855	.731	2.275	1.373
Ne vjerujem u vlastiti uspjeh. (R) / I do not believe in my success.	0.399	.159	2.412	1.330
Ne vjerujem da se mogu nositi s pritiskom. (R) / I do not believe that I can cope with pressure.	0.579	.336	2.069	1.299
Prosječne vrijednosti za cijelu ljestvicu / Average values for entire scale			**2.900**	**1.252**
Kaiser-Meyer-Olkin Measure / Bartlett's Test of Sphericity	.901		1038.984** (df=78)	
Eigenvalue / Variance Explained (%)	6.788		52.218	
Reliability / Pouzdanost (Cronbach's alpha)	0.842			

Legenda/legend: r=korelacija varijable s komponentom (correlation of variables with component); h2= komunalitet (communality)

For the first measuring instrument (Cognitive Anxiety Scale), applied on Croatian sample(s) of male and female athletes, Kaiser-Meyer-Olkin's Measures of Sampling Adequacy and Bartlett's Tests of Sphericity indicate that correlation matrix are adequate for factorization. Application of PCA (Table 1), as well as the scree plot, indicate a steep drop of eigenvalues, which revealed one-component structure, both in males and females. Only principal component accounts about 45% of the total variance explained for males and 52% of the total variance explained for females. Basic descriptives (means and standard deviations) indicate that majority of means, 8 out of 14, have values above theoretical average (3.00) in males, while only two means have similar value in females. Reliability type internal consistency (Cronbach's alpha) of this scale is high and thus satisfactory, in male and female athletes.

Table 2: Somatic Anxiety Scale: descriptive characteristics and results of Principal Components Analysis (PCA) with Varimax rotation, with belonging reliabilities, applied on the samples of male and female athletes

Tablica 2. Skala somatske anksioznosti: deskriptivna obilježja i rezultati analize glavnih komponenti (PCA) s pripadnom pouzdanošću, na uzorcima sportaša i sportašica

Čestice – sportaši / Items - males	r	h^2	Mean	Std. Dev.
Osjećam izrazitu nervozu za vrijeme natjecanja. / I feel extreme anxiety during competition.	0.650	.423	2.529	1.287
Znoje mi se dlanovi. / My palms sweating.	0.512	.262	**2.637**	**1.370**
Nedostaje mi zraka. / I am out of air.	0.585	.342	1.706	0.971
Mišići su mi napeti. / My muscles are tense.	0.583	.339	2.624	1.295
Drhtim. / I'm shivering.	0.610	.372	1.851	1.099
Srce mi jako lupa. / My heart pounding.	0.613	.375	**2.931**	1.366
Imam osjećaj da ću se onesvijestiti. / I have a feeling I'm gonna faint.	0.526	.276	1.277	0.695
Ljulja mi se tlo pod nogama. / The ground under my feet is rocking.	0.525	.276	1.490	0.898
Osjećam leptiriće u trbuhu. / I feel butterflies in my stomach.	0.434	.189	2.392	1.336
Prije natjecanja nemam apetit. / I have no appetite before the competition.	0.491	.241	2.257	1.246
Prije natjecanja teško zaspim. / Before the competition, I have difficult to fall asleep.	0.469	.220	2.500	**1.440**
Osjećam mučninu prije natjecanja. / I feel sick before the competition.	0.623	.388	1.812	1.138
Zbog nervoze imam proljev ili povraćanje prije natjecanja. / Because of the nervousness I have diarrhea or vomiting before the competition.	0.412	.170	1.313	0.751
Prosječne vrijednosti za cijelu ljestvicu / Average values for entire scale			2.100	1.146
Kaiser-Meyer-Olkin Measure / Bartlett's Test of Sphericity	.742		286.640** (df=78)	
Eigenvalue / Variance Explained (%)	3.874		29.799	
Reliability / Pouzdanost(Cronbach's alpha)	0.793			
Čestice – sportašice / Items - females	r	h^2	Mean	Std. Dev.
Osjećam izrazitu nervozu za vrijeme natjecanja. / I feel extreme anxiety during competition.	0.623	.388	**2.702**	1.393
Znoje mi se dlanovi. / My palms sweating.	0.545	.297	2.611	**1.506**

Nedostaje mi zraka. / I am out of air.	0.629	.396	1.922	1.304
Mišići su mi napeti. / My muscles are tense.	0.600	.359	2.636	1.281
Drhtim. / I'm shivering.	0.755	.571	2.007	1.287
Srce mi jako lupa. / My heart pounding.	0.685	.469	**2.833**	1.374
Imam osjećaj da ću se onesvijestiti. / I have a feeling I'm gonna faint.	0.691	.477	1.368	0.875
Ljulja mi se tlo pod nogama. / The ground under my feet is rocking.	0.699	.488	1.399	0.865
Osjećam leptiriće u trbuhu. / I feel butterflies in my stomach.	0.708	.501	2.438	**1.423**
Prije natjecanja nemam apetit. / I have no appetite before the competition.	0.422	.178	2.077	1.384
Prije natjecanja teško zaspim. /Before the competition, I have difficult to fall asleep.	0.545	.297	2.113	1.410
Osjećam mučninu prije natjecanja. / I feel sick before the competition.	0.672	.452	1.887	1.254
Zbog nervoze imam proljev ili povraćanje prije natjecanja. / Because of the nervousness I have diarrhea or vomiting before the competition.	0.570	.325	1.319	0.906
Prosječne vrijednosti za cijelu ljestvicu / Average values for entire scale			2.100	1.251
Kaiser-Meyer-Olkin Measure / Bartlett's Test of Sphericity	.857		693.822** (df=78)	
Eigenvalue / Variance Explained (%)	5.200		39.999	
Reliability / Pouzdanost (Cronbach's alpha)	0.865			

Legenda/legend: r=korelacija varijable s komponentom (correlation of variables with component); h^2= komunalitet (communality)

For the second measuring instrument (Cognitive Anxiety Scale), applied on Croatian sample(s) of male and female athletes, Kaiser-Meyer-Olkin's Measures of Sampling Adequacy and Bartlett's Test of Sphericity indicate that correlation matrix are adequate for factorization. Application of PCA (Table 2), as well as the scree plot, indicate a steep drop of eigenvalues, that revealed one-component structure. Only principal component accounts about 30% of the total variance explained for males and 40% of the total variance explained for females. Basic descriptives (means and standard deviations) and communalities are presented in the Table 2, where it is obvious that all means have values lower than is theoretical average (3.00), both in males and females. Reliability type internal consistency (Cronbach's alpha) of this scale is high (both in males and females) and thus satisfactory.

Table 3: Mental Toughness Scale: descriptive characteristics and results of Principal Components Analysis (PCA) with Varimax rotation, with belonging reliabilities, applied on the sample of male athletes

Tablica 3. Mentalna žilavost: deskriptivna obilježja i rezultati analize glavnih komponenti (PCA) s pripadnom pouzdanošću, na uzroku sportaša

Čestice / Items	f1	f2	f3	f4	h^2	Mean	Std. Dev.
Imam osjećaj da na treningu radim korisne stvari. / I have a feeling that I'm doing useful things at the training.	**0.663**				.569	4.206	0.825
Dobrim planiranjem mogu povećati uspjeh u sportu. / With god planning I can increase success in the sport.	0.436		**0.510**		.473	4.140	0.899
Volim se držati dnevnog rasporeda. / I like to keep daily schedule.				**0.769**	.718	3.881	1.116
Ako pomislim da neću uspjeti u sportu, gubim volju. (R) / If you think that I will not succeed in the sport, I'm losing the will.				**0.471**	.230	3.922	1.303
Ne volim puno planirati u sportu. (R) / I do not like a lot of planning in sport.				**0.407**	.203	3.127	1.264
Samo upornim radom možeš postići svoje ciljeve u sportu. / Only with hard work you can achieve your goals in the sport.		**0.610**			.573	4.604	0.722
Uživam u treninzima i natjecanjima. / I enjoy training and competitions.	**0.490**	0.372	0.412		.566	4.539	0.829
Na treningu obično šutim i radim. / At the training, I usually keep quiet and work out.	**0.389**				.162	3.490	1.141
Spreman/na sam potražiti pomoć kad izvodim zahtjevnu vježbu na treningu. / I'm ready to go for help when I perform a demanding exercise in training.	**0.403**				.197	3.673	1.123
Moji suigrači ili kolege (sportaši) me cijene. / My teammates or fellow athletes appreciate me.		**0.398**			.386	4.188	0.796

Isplati se davati sve od sebe u sportu. / It pays to give your best in the sport.	**0.726**			.634	4.594	0.790	
Volim kad se stvari u sportu odvijaju onako kako sam zamislio/la. / I love it when things in the sport work out as I imagined.		**0.683**			.491	4.637	0.686
Volim izazove u sportu. / I love challenges in sport.			**0.496**		.424	4.634	0.797
Treninzi i natjecanja mi čine život zanimljivim i uzbudljivim. / Training and competition make my life interesting and exciting.	**0.584**		0.458		.614	4.529	0.817
Volim izvoditi složene vježbe na treningu. / I like to perform complex exercises in training.	**0.570**				.406	3.961	1.080
Volim promjene i uzbuđenja u životu. / I love change and excitement in life.			**0.593**		.472	4.137	0.975
Volim raditi različite stvari istovremeno. / I like to do different things at the same time.			**0.553**		.401	3.248	1.203
Volim osjećaj kontrole u sportu. / I like to do different things at the same time.		0.357	**0.661**		.572	4.376	0.823
Volim strukturu u životu. / I like structure in life.			0.415	**0.704**	.692	3.690	1.125
Volim kada mi sve ide po planu. / I love it when all is going according to plan.		**0.771**			.604	4.690	0.615
Rijetko mijenjam svoj raspored. / I rarely change my schedule.	**0.524**				.374	3.525	1.188
Samo dobrim planiranjem mogu ostvariti uspjeh u sportu. / Only good planning can achieve success in the sport.	**0.531**				.423	3.549	1.183
Mislim da sam uporniji od većine sportaša. / I think I'm more persistent than most athletes.	**0.585**				.390	3.673	1.069
Ne odustajem unatoč neuspjesima. / I'm not giving up despite failures.		**0.586**			.457	4.510	0.741
Kad mi je najteže dignem glavu i idem dalje. / When is the most difficult, I raise my head and move on.			**0.403**		.372	4.039	1.004
Prosječne vrijednosti za cijelu ljestvicu */ Average values for entire scale*						4.060	0.965
Kaiser-Meyer-Olkin Measure / Bartlett's Test of Sphericity	.708				773.522** (df=300)		
Eigenvalue	3.360	3.280	2.720	2.044			
Variance Explained (%)	13.440	13.120	10.881	8.174			
Reliability / Pouzdanost (Cronbach's alpha)	0.731	0.757	0.629	0.530			

Legenda/legend: r=korelacija varijable s komponentom (correlation of variables with component); h2= komunalitet (communality); f1= predanost i savjesnost (commitment and conscientiousness); f2= samopouzdanje i ustrajnost (confidence and perseverance); f3= izazov i planiranje (challenge and planning); f4= kontrola, fokusiranost (control, focus)

For the third measuring instrument (Hardiness/ Mental Toughness Scale), applied on Croatian sample(s) of male athletes, Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity indicate that correlation matrix is adequate for factorization. Application of PCA with Varimax rotation (Table 3), as well as the scree plot, indicate a steep drop of eigenvalues, that revealed four-component structure, with factors named: Commitment and Consciousness, Self-confiedence and Resistence, Challenge and Planning, and Control and Focus. All four components account about 46% of the total variance. Other data, such as descriptives and communalities, can be seen in the Table 3, where it is obvious that all means have values above theoretical average (3.00). Reliabilities type internal consistency (Cronbach's alpha) of this scale are low to moderate and thus satisfactory.

Table 4: Mental Toughness Scale: descriptive characteristics and results of Maximum Likelihood with Promax rotation, with belonging reliabilities, applied on the sample of female athletes

Tablica 4. Mentalna žilavost: deskriptivna obilježja i rezultati faktorske analize Maximum likelihood s Promax rotacijom na uzorku sportašica

Čestice / Items	f1	f2	f3	h^2	Mean	Std. Dev.
Imam osjećaj da na treningu radim korisne stvari. / I have a feeling that I'm doing useful things at the training.	**.730**			.540	4.13	1.008
Dobrim planiranjem mogu povećati uspjeh u sportu. / With god planning I can increase success in the sport.		**.871**	.519	.780	3.90	1.113
Volim se držati dnevnog rasporeda. / I like to keep daily schedule.	.353	**.574**		.345	3.73	1.266
Samo upornim radom možeš postići svoje ciljeve u sportu. / Only with hard work you can achieve your goals in the sport.	.463	**.598**	.529	.430	4.59	.763
Uživam u treninzima i natjecanjima. / I enjoy training and competitions.	**.758**	.400	.506	.607	4.46	.847
Isplati se davati sve od sebe u sportu. / It pays to give your best in the sport.	**.660**			.437	4.73	.601
Volim kad se stvari u sportu odvijaju onako kako sam zamislio/la. / I love it when things in the sport work out as I imagined.		.427	**.912**	.857	4.62	.693
Volim izazove u sportu. / I love challenges in sport.	**.606**			.371	4.22	1.021
Treninzi i natjecanja mi čine život zanimljivim i uzbudljivim. / Training and competition make my life interesting and exciting.	**.742**	.397	.472	.572	4.43	.883
Volim izvoditi složene vježbe na treningu. / I like to perform complex exercises in training.	**.537**			.297	3.81	1.169
Volim promjene i uzbuđenja u životu. / I love change and excitement in life.		.434	**.463**	.256	4.23	1.025
Volim raditi različite stvari istovremeno. / I like to do different things at the same time.		**.435**		.197	3.25	1.169
Volim osjećaj kontrole u sportu. / I like to do different things at the same time.	.411	.620	**.630**	.494	4.19	.965
Volim strukturu u životu. / I like structure in life.		**.387**		.157	3.70	1.047
Volim kada mi sve ide po planu. / I love it when all is going according to plan.		.458	**.803**	.659	4.62	.749
Samo dobrim planiranjem mogu ostvariti uspjeh u sportu. / Only good planning can achieve success in the sport.		**.630**		.399	3.28	1.267
Ne odustajem unatoč neuspjesima. / I'm not giving up despite failures.	**.632**			.402	4.16	1.003
Kad mi je najteže dignem glavu i idem dalje. / When is the most difficult, I raise my head and move on.	**.579**	.415		.371	3.84	1.167
Ako mogu spreman sam pomoći suigračima ili kolegama u ostvarenju ciljeva. / If I can, I am ready to help my teammates or colleagues to achieve goals.	.464	.393	**.569**	.375	4.67	.657
Ako pomislim da neću uspjeti u sportu ne gubim volju. / Even if I think I will not make it I am not losing will.	**.502**			.330	3.760	1.399
Prosječne vrijednosti za cijelu ljestvicu / Average values for entire scale				4.120	0.991	
Kaiser-Meyer-Olkin Measure / Bartlett's Test of Sphericity	.840			1029.344** (df=190)		
Eigenvalue	5.717	2.075	1.086			
Variance Explained (%)	28.583	10.376	5.429			
Reliability / Pouzdanost (Cronbach's alpha)	0.580	0.738	0.650			

Legenda: r=korelacija varijable s komponentom (correlation of variables with component); h2= komunalitet (communality); f1= predanost, ustrajnost i izazov (commitment, perseverance and challenge); f2= kontrola i savjesnost (control and conscientiousness) ; f3= kontrola (control)

For the third measuring instrument (Hardiness/ Mental Toughness Scale), applied on Croatian sample(s) of female athletes. Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity indicate that correlation matrix is adequate for factorization. Application of Maximum Likelihood with Promax rotation (Table 4), as well as the scree plot, indicate a steep drop of eigenvalues, that revealed three-component structure, with factors named: Commitment. Resiliance and Challenge; Control and Consciousness; Control. All three components account about 46% of the total variance. Other data, such as descriptives and communalities, can be seen in the Table 3, where it is obvious that all means have values above theoretical average (3.00). Reliabilities type internal consistency (Cronbach's alpha) of this scale are low to moderate and thus satisfactory. Factor Correlation Matrix showed that all factors obtained are moderately high and positively correlated: the correlation between first and second factor is 0.465, between first and third factor 0.460 and between second and third factor 0.593.

Table 5: Descriptive characteristics of MUSI scales from this study and from previous research (Sindik et al., 2015)
Tablica 5. Deskriptivna obilježja svih ljestvica MUSI iz ovog istraživanja te prethodnog istraživanja (Sindik i sur., 2015)

Obilježja / Characteristics	Females			Males		
	Mean	Std. Deviation	Kolmogorov -Smirnov	Mean	Std. Deviation	Kolmogorov -Smirnov
Energiziranost / Energizing	3.745	0.763	0.47	3.856	0.713	0.99
Kognitivna anksioznost / Cognitive anxiety	3.084	0.793	0.50	2.893	0.720	0.65
Somatska anksioznost / Somatic anxiety	2.071	0.775	0.10	2.091	0.618	0.69
Vještina održavanja pažnje / maintenance attention skill	3.621	0.796	0.02*	3.530	0.569	1.11
Svjesnost o stanju pažnje / awareness about the state of attention	3.513	0.651	0.34	3.650	0.650	1.16
Široka unutarnja pažnja / wide inner attention	2.516	0.800	0.24	2.597	0.878	0.80
Široka vanjska pažnja / wide external attention	3.653	0.680	0.23	3.660	0.589	0.77
Svjesnost o pažnji tijekom izvedbe / awareness of the attention during the performance	3.733	0.784	0.03*	3.799	0.781	1.22
Govor u sebi / speaking to myself	3.292	0.890	0.33	3.363	0.928	1.50*
Uska vanjska pažnja / narrow external attention	3.783	0.674	0.21	3.934	0.534	0.83
Predanost, ustrajnost i izazov (F) / predanost i savjesnost (M) / commitment, perseverance and a challenge (F) / commitment and conscientiousness (M)	3.977	0.580	0.01**	3.903	0.585	1.01
Kontrola i savjesnost (F) / samopouzdanje i ustrajnost (M) / control and conscientiousness (F) / self-confidence and perseverance (M)	3.755	0.726	0.08	4.536	0.488	1.96**
Kontrola (F) / izazov i planiranje (M) / control (F) / challenge and planning (M)	4.456	0.602	0.00**	4.097	0.573	1.50*
Kontrola, fokusiranost (M) / Control, focus	-	-	-	3.794	0.749	1.29

In Table 5 is presented descriptive characteristics for all MUSI scales from this study and from previous research, i.e. from its preliminary application on the samples of athletes. These results can be used as orientation temporarily standards. It is obvious that athletes demonstrate mostly scores above theoretical average scores in desirable psychological characteristics.

Table 6: Correlations between all scales in MUSI from this study and from previous research (Sindik et al., 2015) for male athletes

Tablica 6. Korelacije između svih ljestvica MUSI iz ovog istraživanja te prethodnog istraživanja (Sindik i sur., 2015) za sportaše

Sportaši / Male athletes	E	KA	SA	VOP	SOSP	SUP	SVP	SOPTI	GUS	UVP	PS	SU	IP	KF
E	1	-0.08	-0.12	0.42**	0.49**	-0.18	0.40**	0.30**	0.03	0.64**	0.42**	0.46**	0.52**	0.35**
KA		1	0.58**	-0.26**	0.09	0.71**	-0.15	-0.16	0.52**	-0.04	0.04	-0.03	-0.14	-0.48**
SA			1	-0.25**	-0.03	0.59**	-0.18	-0.13	0.43**	-0.07	0.06	-0.09	-0.06	-0.40**
VOP				1	0.39**	-0.39**	0.65**	0.40**	-0.05	0.54**	0.53**	0.39**	0.39**	0.37**
SOSP					1	0.09**	0.55**	0.44**	0.17	0.47**	0.32**	0.39**	0.33**	0.18**
SUP						1	0.19	-0.30**	0.49**	-0.18	-0.15	-0.24**	-0.12	-0.51**
SVP							1	0.45**	-0.01	0.54**	0.35**	0.46**	0.49**	0.30**
SOPTI								1	-0.09	0.38**	0.46**	0.37**	0.44**	0.47**
GUS									1	-0.01	0.17	0.04	0.11	-0.23*
UVP										1	0.58**	0.45**	0.58**	0.29**
PS											1	0.53**	0.48**	0.31**
SU												1	0.45**	0.27**
IP													1	0.30**
KF														1

E=energiziranost (energize); KA=kognitivna anksioznost (cognitive anxiety); SA= somatska anksioznost (somatic anxiety); VOP= vještina održavanja pažnje (skills maintenance attention); SOSP= svjesnost o stanju pažnje (awareness about the state of attention); SUP= široka unutarnja pažnja (tight internal attention); SVP= široka vanjska pažnja (wide external attention); SOPTI= svjesnost o pažnji tijekom izvedbe (awareness of the attention during the performance); GUS= govor u sebi (internal speech); UVP= uska vanjska pažnja (focused external attention); PS= predanost i savjesnost (commitment and conscientiousness); SU= samopouzdanje i ustrajnost (confidence and perseverance); IP= izazov i planiranje (challenge and planning); KF= kontrola i fokusiranost (control and focus)

Insight in correlation matrix for male athletes (Table 6) offers the information that most of the characteristics are significantly, but only low to moderate high correlated. The correlations between desirable psychological characteristics related with similar psychological concepts (e.g. cognitive and somatic anxiety) are higher positively correlated.

Table 6: Correlations between all scales in MUSI from this study and from previous research (Sindik et al., 2015) for male athletes

Tablica 6. Korelacije između svih ljestvica MUSI iz ovog istraživanja te prethodnog istraživanja (Sindik i sur., 2015) za sportaše

Sportašice / Female athletes	E	KA	SA	VOP	SOSP	SUP	SVP	SOPTI	GUS	UVP	PUI	KS	K
E	1	-0.11	-0.19*	0.55**	0.14	-0.35**	0.56**	0.43**	0.00	0.49**	0.67**	0.49**	0.38**
KA		1	0.58**	-0.33**	0.45**	0.60**	-0.23**	-0.22**	0.47**	0.02	0.07	0.15	0.27**
SA			1	-0.24**	0.24**	0.46**	-0.25**	-0.17*	0.32**	-0.03	-0.08	0.07	0.07
VOP				1	0.03	-0.56**	0.78**	0.64**	0.02	0.47**	0.62**	0.34**	0.24**
SOSP					1	0.35**	0.27**	0.12	0.38**	0.40**	0.18	0.32**	0.33**
SUP						1	-0.40**	-0.37**	0.54**	-0.08	-0.34**	-0.01	0.08
SVP							1	0.62**	0.01	0.62**	0.55**	0.43**	0.40**
SOPTI								1	0.05	0.60**	0.45**	0.31**	0.26**
GUS									1	0.12	-0.03	0.35**	0.33**
UVP										1	0.55**	0.34**	0.49**
PUI											1	0.42**	0.46**
KS												1	0.56**
K													1

E- energiziranost (energize); KA=kognitivna anksioznost (cognitive anxiety); SA= somatska anksioznost (somatic anxiety); VOP= vještina održavanja pažnje (skills maintenance attention); SOSP= svjesnost o stanju pažnje (awareness about the state of attention); SUP= široka unutarnja pažnja (tight internal attention); SVP= široka vanjska pažnja (wide external attention); SOPTI= svjesnost o pažnji tijekom izvedbe (awareness of the attention during the performance); GUS= govor u sebi (internal speech); UVP= uska vanjska pažnja (focused external attention); PUI= predanost, ustrajnost i izazov (commitment, perseverance and a challenge); KS= kontrola i savjesnost (control and conscientiousness); K= kontrola (control)

Insight in correlation matrix for female athletes (Table 7) offers similar information as these in male athletes.

Discussion

Basic information about construct validities and reliabilities about the subscales in the battery MUSI indicate that the reliabilities and validities are satisfactory to very satisfactory. One-component scales for somatic and cognitive anxiety are one-component and very similar structured both in males and females. Three-factorial scale obtained for mental toughness/ hardiness in female athletes, while the four-component scale is revealed for mental toughness/ hardiness in male athletes. Moreover, the structures of factors of mental toughness/ hardiness in male and female athletes are quite different, what is supported with research that indicates specific profiles of hardiness in women (5). Hardiness in women is in one study also significantly associated with age, education level, and marital status (16). These results offer a positive guidance for future adjustment of the questionnaires in MUSI for specific subpopulations of the athletes, while orientation standards offer useful information for sport coaches and sport psychologists, in current work with athletes. However, these orientation standards have to be taken with caution, because the subsamples of athletes which are examined are misbalanced, according to the type of sport, level of sport excellence, stages of athletes' sports development (sport experience), age differences, etc. Correlation matrices for male and female athletes are similar for males and females. Most of the characteristics are significantly, but only low to moderate high correlated. Zero-correlations are found only between quite conceptually different psychological characteristics, such as between aspects of mental toughness/ hardiness and aspects of somatic and cognitive anxiety. Such zero-ordered correlations can be described as 'mental tough athlete need not necessary to be without any anxiety' or 'the fear is the basic for become brave'). According to our results, both in males and females, we didn't obtain the dimensions which are clearly explainable. Thus, the 'experiment' of mixing mental toughness and hardiness could be probably more effective if we make an effort to define one-factorial construct (named mental toughness/ hardiness), but with proportional representation certain conceptual components of the hardiness and/or mental toughness.

The relations between desirable psychological characteristics, related with similar psychological concepts (e.g. cognitive and somatic anxiety, characteristics of the attention), are low to moderately high positively and significantly intercorrelated.

The advantage of this research is the application of these (new) questionnaires in MUSI for the first time. These results offer the preliminary insight in main psychometric properties of these (new) questionnaires, with orientation standards. Moreover, these instruments have a purpose to be adjusted to the working style of sports psychologists, taking into account available time (all these instruments need short time to administering).

The main shortcoming of the research is the fact that initial validation of the questionnaires was stratified only by gender. The number of participants was not representative: it is disproportional, according to different types of sports, as well as to other relevant factors, especially when we additionally consider age groups that athletes belong to, levels of sport excellence, etc. However, we have emphasized that this study is only preliminary validation of these measuring instruments, which have to be improved and adjusted according to all abovementioned criteria (relevant factors).

Thus, the main directions for future research can be applying these questionnaires from MUSI on precisely stratified samples, according to all relevant factors mentioned before: type (specificity) of sport; characteristics of the activity (the training or competition); level of sport excellence; stages of athletes' sports development; age differences, etc. For example, we can examine male senior elite basketball players or female junior semi-professional volleyball players, etc. However, we can try to obtain clear dimensions of mental toughness/ hardiness, checking different methodological strategies in performing factor analysis: for example, trying to obtain one-factorial solution, or conceptually 'clear' dimensions, such as: commitment, challenge, etc.

Practical implications of this study may lead to defining of the orientation standards (expressed in this study in terms of average values: means and standard deviations), arising from this initial application of the questionnaires. In spite of their robustness, these standards could offer the useful information for sport coaches, as well as for sport psychologists, serving as the start point to develop individualized training programs to improve important psychological skills, especially in elite training centers around the world.

Conclusions

Results of factor analysis and examination of reliability of internal consistency showed that each of subscales in the battery MUSI has satisfactory reliability and validity: one-component scales for somatic and cognitive anxiety, as well as three-factorial scale for mental toughness/hardiness in female athletes, and four-component scale for mental toughness/hardiness in male

athletes. These results offer a positive guidance for future adaptation of the questionnaires in MUSI for specific subpopulations of the athletes: type (specificity) of sport; characteristics of the activity (the training or competition); level of sport excellence; stages of athletes' sports development; age differences, etc. Insight in correlation matrix for male and female athletes shows the same trends: most of the characteristics are significantly, but only low to moderate high correlated; the correlations between desirable psychological characteristics related with similar psychological concepts (e.g. cognitive and somatic anxiety) are higher (but low to moderately) positively correlated. Orientation standards already offer useful information for sport coaches, sport psychologists and physiotherapists.

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